

THE INTRODUCTION OF A EUROPEAN SCOLYTID (THE SMALLER ELM BARK-BEETLE, *SCOLYTUS MULTISTRIATUS* MARSH) INTO MASSACHUSETTS.<sup>1</sup>

BY J. W. CHAPMAN.

The Scolytidae are most generally known as bark-borers and consequently many entomologists have given the name of bark-beetles to the entire group. They are a very important group of insects in as much as they are very nearly all tree-feeders. For convenience they might be put into two classes, those that attack our conifers and those that work almost exclusively on our deciduous trees of the forest and shade varieties.

We have found from experience in past years just how important economically are the beetles of the class that infest our conifers, since they have caused a loss of several millions of dollars yearly to different parts of our country.<sup>2</sup> It looks now, from the bark-borer which has recently attacked our elms, as though we were going to have an opportunity to learn of the second class of beetles in the same manner. Europeans have had this problem confronting them for years and it has proved to be one of the most serious with which they have had to deal, because many of these beetles have become such exclusive feeders that they will attack only one kind of tree.

In Germany the most destructive species to elms is the large Elm bark-borer, *Scolytus Geoffroyi* Goetze or the "Grosser Ulmen-Splintkäfer" of which Eichhoff gives a good account.<sup>3</sup> He reports that closely associated with it and occurring on the same trees in a peculiarly neighborly or almost symbiotic fashion is the "Kleiner dichtgestreifter Ulmen-Splintkäfer" (*Scolytus multistriatus*). Just what this relationship signifies other than a social tendency of these insects one can hardly say. These two species confine their attacks chiefly to elm trees and considered together they are among the most dreaded pests in elm growing districts. In France the parks and boulevards of

---

<sup>1</sup> Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 18.

<sup>2</sup> Hopkins, A. D., Bark beetles of the Genus *Dendroctonus*, Bull. U. S. Bur. Entom., No. 83, pt. 1; The Genus *Dendroctonus*, Bull. U. S. Entom. Tech. Ser., No. 17, pt. 1. (1909).

<sup>3</sup> Die Europäische Borkenkäfer Julius Springer, Berlin, 1881.

Paris have been severely damaged and whole tracts of the elms have been killed.<sup>1</sup> In England the elms of London Park and southern England have been severely injured.<sup>2</sup> We see from this that *Scolytus multistriatus* is very widely distributed in Europe, since, as Eichhoff states, it covers the entire central portion of that continent.

This beetle was first found in the United States and recognized as *Scolytus multistriatus* Marsh in October, 1909, while extensive collections of Leopard Moth larvae were being made from limbs of elms and ash in the College yard, at Harvard. These limbs had to be barked and split for the purpose of securing the larvae of the Leopard Moth, and it was during this process that the *multistriatus* larvae were found. At that time the grubs were about full grown. No live adult beetles were found, but the mother of each brood was found dead in her chamber. A number of these females were extracted in a sufficiently perfect condition to make the identification of the species possible. This identification was kindly made for me by Dr. A. D. Hopkins of the Federal Bureau of Entomology.

After the species was identified I was desirous of knowing to what extent the trees in the surrounding country were infested, and to ascertain if possible about how long the beetles have been in this country. Under ordinary conditions this would have been a difficult matter. But the city of Cambridge was at that time removing from the streets in different parts of the city a hundred or more elm trees which were either dead or in a dying condition. These were all examined. The trunks and larger limbs of the majority of those that were taken out were yet alive. Different parts of the trees were carefully inspected in order to ascertain where the beetles first made their attack. Observations clearly showed that it was invariably above the middle upper part of the trunk, and usually on the larger limbs. The beetles are quite aggressive and as many as two hundred mother beetles were found in a space less than two feet square on a living trunk. Larvae were also taken from the smaller green limbs of standing trees. Without exception every felled tree examined showed hundreds of beetle markings and larvae. A representative number of those standing were carefully examined and nearly every one showed "shot-holes" of the beetles. It is difficult to ascertain the extent of the in-

---

<sup>1</sup> Barbey, A. Les Scolytides de l'Europe Centrale H. Kündig, Geneva, 1901.

<sup>2</sup> Gillanders, Forest Entomology, 1908.

festation of a standing tree until the bark is removed and this was not feasible. One could only make an estimate from the "shot-holes" that appeared on the external surface.

While making these observations a native American Scolytid, *Hylesinus opaculus* Leconte, which lives only in dead wood, was also found in abundance. Apparently this species has come to assume somewhat the same relation to *S. multistriatus* in this country as *S. multistriatus* does to *S. Geoffroyi* in Europe, the only difference probably being that the American species hibernates in the adult beetle stage, while *S. multistriatus* hibernates in the larval stage.

About the middle of November a representative number of trees were examined in the College yard for bark-beetles. It was an exceedingly difficult task as the trees were large, and the "shot-holes" which the beetles make were difficult to locate. The trunks, large limbs and upper branches of each tree selected were carefully gone over. "Shot-holes" of the beetles were found on all of the trees and many of the adult beetles of our American species were busy, making temporary hibernating burrows. These could easily be located by the reddish boring dust which was freshly thrown out. Since these trees were selected in different parts of the yard with a view to making an estimate, I can say that it is quite likely that every tree in the yard harbors some beetles, but just how numerous they are cannot be stated.

I have not been able to follow the complete normal development of these beetles through and therefore do not know positively whether there is one or two broods annually. However, from the observations I have been able to make I feel quite secure in saying that there is only one brood. A number of small limbs which contained adult grubs were collected in October. These have been examined from time to time and up to date there has been no perceptible change in the larvae. The generations of these beetles vary considerably as is seen from the European reports. Eichhoff says that the same species may or may not have two broods annually, depending entirely on its geographical location. Gillanders reports that some of these bark-beetles have two broods in southern and one in northern England. Each of these writers mentions the fact that *S. multistriatus* may have two broods annually though this really seems to be an unsettled question.

*Scolytus multistriatus* confines itself almost entirely to elm trees, and to such a degree that it is known generally as the "smaller elm bark-beetle." Its habit of attacking injured or weakened trees gives

it practically an unlimited field in which to work as most of our park and shade trees are in a more or less unhealthy state, due to the lack of a proper amount of water and to crowding as well as to many other unfavorable conditions.

The first of December, 1909, some limbs which were about three inches in diameter and showed evidence of containing larvae, were sawed into short pieces and placed in the hot house in large glass jars. To get advantage of a high temperature the jars were placed directly over the steam pipes and kept well covered. Several times a week the pieces of limbs were submerged in water for an instant in order to keep them sufficiently moist so that development might continue. On January 13, 1910, the first adult beetles made their appearance. Some of the limbs were barked and pupae were found in various stages of development. The adult beetles were put into small dishes containing small pieces of fresh elm limbs. The females began almost immediately to make their burrows. When the galleries were about 10 mm. in length I noticed that the males were beginning to loiter about the mouths of the burrows, one male to each opening. Occasionally they would take a hand in removing the boring-dust from the entrance. Very often they would sally forth on a sort of exploration trip which would last only for a few minutes, then they would return to the same opening they had previously left. From two to five days after this relationship had begun copulation took place, and, as was supposed by Eichhoff and others, this occurred at the entrance to the burrow. The time required was from five to ten minutes in the cases observed. Activity was then resumed. The male seldom left the entrance afterwards but kept busying himself removing boring dust. The pairs that mated in this way were isolated with as little disturbance as possible and placed in other dishes in order that daily observations might be made on them. The females continued to excavate their chambers, which in this species are quite straight and always with the grain of the wood. Ten days after copulation I opened the chamber of one of the pairs that had been isolated. On each side of the mother gallery and connecting with it were miniature chambers. In each was a small, shining white egg, securely packed into its place by bits of boring dust. The two parent beetles were placed in another dish with some new elm. In a day or two both were found dead. I then opened the chamber of a second pair of beetles. This one contained eighteen eggs and it was somewhat longer than the first. I removed the parents

to another dish as had been done with the previous pairs. They immediately began work again as if they had never been disturbed.

The manner of excavating the egg galleries and the direction in which they are always made leave a characteristic marking by which the species can always be recognized. This peculiarity is more strikingly brought out when compared with the egg galleries of the other species (*Hylesinus opaculus*) Leconte shown on plate IV, figure 11. In this American species the mother gallery is two-armed and is always made across the grain of the wood. The adult *multistriatus* beetles are small, 2 to 3 mm. long. Thorax black, shining, somewhat longer than broad; elytra pitehy red; antennae and legs light-brown; elytra with close finely punctured striae; abdomen thickly covered with hairs, and viewed sidewise there is a strong horizontal projection on the second segment of the abdomen, which is peculiar to this species. (See plate IV, figs. 7 and 8.) The male is somewhat smaller than the female, with the front flat and thickly covered with hairs. The female has a convex front covered with few hairs, and on the third and fourth segments of the abdomen are prominent toothed projections. The larvae are scolytoid in character (see plate IV, fig. 6). As soon as they hatch the larvae eat their way into the surrounding wood at approximately right angles to the mother gallery (see plate V, fig. 10). When they become full-grown they pupate at the end of their burrow. This takes place according to the European accounts about the first week in May, or a little later. The adult beetles make their appearance in June and July. They come forth at this time in such numbers, says Eichhoff, that large, apparently healthy elms are attacked and completely destroyed in one season.

Since this species is so destructive and our experience with it is so limited, the following remarks, taken from European literature, ought to interest all those who desire to aid in the preservation of our shade elms.

In order to prevent an attack of the bark-beetle it is necessary to remove all centers of infestation from which they might spread to sound trees. Just how feasible this may prove to be depends, of course, on the local circumstances, but whatever care is exercised in other ways, it is very unlikely that much good will be done in lessening attack, so long as the inexcusable practice prevails of leaving trunks of infested elms standing, with the bark still on them, when this contains thousands of grubs which will shortly change to perfect beetles

ready to fly to the nearest growing elms. Scores of just such trunks as these may be seen on the streets and vacant lots of Cambridge and one can without difficulty strip off yards of the bark from them with the hands alone. If this bark is allowed to remain swarming with larvae it is an abiding and serious source of infestation and injury to growing trees. *If property owners would acquaint themselves with this fact, and of the mischief thus caused both to their own trees and to those of the neighborhood, they would undoubtedly take immediate steps to have the bark removed. All dead trees and old trunks with loose bark should have it removed and burned by the first of May, 1910, at the very latest. This will prevent thousands of these beetles from flying to other healthy trees, and thus be the means of protecting them from the attacks of the beetle.*

Observations are to be continued throughout the spring and summer, and a number of experiments will be conducted at the same time. These with further interesting data on the species will be reserved for a later paper.

I wish to express my gratitude to Dr. W. M. Wheeler for the many helpful suggestions which he has given, and to Mr. C. T. Brues for his kind assistance in preparing the plates.

#### EXPLANATION OF PLATES.

##### Plate IV.

- Fig. 1. Pupa — *S. multistriatus* Marsh.— Ventral view.
- Fig. 2. Same — Dorsal view.
- Fig. 3. Same — Lateral view.
- Fig. 4. Larva — *S. multistriatus*.— Ventral view.
- Fig. 5. Same — Dorsal view.
- Fig. 6. Same — Lateral view.
- Fig. 7. *S. multistriatus* — Male.
- Fig. 8. *S. multistriatus* — Female.
- Fig. 9. Egg outline, *S. multistriatus*.
- Fig. 10. Mother and larval galleries of *S. multistriatus*.
- Fig. 11. Mother and larval galleries of *Hylesinus opaculus* Lec.
- Fig. 12. *Hylesinus opaculus* Lec. Dorsal view.
- Fig. 13. Same — Lateral view.

##### Plate V.

- Fig. 1. Markings of *S. multistriatus* in bark of elm.
- Fig. 2. Showing "shot-holes" or exit holes of same.